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Sir:

Please file the following enclosed patent application papers:

Applicant #1, Name: Jon David Cameron

Applicant #2, Name: Tobin Alexander Gaedke

Title: Thermochromic Bar Codes

☒ Specification, Claims, and Abstract: Nr. of Sheets 12

☒ Declaration: Date Signed: 1997 Dec 6

☒ Drawing(s): Nr. of Sheets Enc.: Formal: 1 Informal: _____

☒ Small Entity Declaration of Inventor(s) ☐ SED of Non-Inventor / Assignee / Licensee

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☒ **Request Under MPEP § 707.07(j):** The undersigned, a pro se applicant, respectfully requests that if the Examiner finds patentable subject matter disclosed in this application, but feels that Applicant's present claims are not entirely suitable, the Examiner draft one or more allowable claims for applicant.

Very respectfully,

Jon David Cameron
Applicant #1 Signature

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Signed: Jon David Cameron Tobin Gaedke
Inventor

Form 10-1: Patent Application Transmittal Letter

Patent Application of

Jon Cameron

and

Tobin Gaedke

for

THERMOCHROMIC BAR CODE

Background -- Field of the Invention

This invention relates to bar codes, specifically to identifying the bar code's temperature range.

Background -- Discussion of Prior Art

Universal Product Code and Bar Code

The Universal Product Code (UPC) bar code was originally introduced in 1971, Uniform Code Council Internet publication at www.uc-council.org/ucchp.htm, to provide an efficient method of matching a product against a pricing file and recording a sale. When the

bar codes were scanned at cash registers, the resultant transaction data was stored electronically. By using this transaction data, businesses could track their products' sales and then market them accordingly. Prior bar code designs also include the European Article Number (EAN) and Japanese Article Number (JAN).

These bar codes all fail to resolve the need for tracking environmental conditions such as location and temperature. When the UPC was introduced in 1971, its scope was to communicate basic information from a main product file to an on-line transaction file. Storing the resultant transactional detail produced unmanageable file sizes. Computer systems of this generation were unable to store and process large transactional databases. These computer systems were unable to manage historical databases with only several fields data, making larger information gathering needs impracticable. Therefore, current applications of the UPC bar code data are limited by its original intention of only limited information retrieval.

Today, data from bar codes are now used by store-planning software to plot packaged goods products within a store. However, store-planning software was not invented until 1979. As space planners became sophisticated in their skill, it became apparent that UPC transaction data could identify product, price, and promotion but not absolute position. Product, price, promotion and position are called the Four P's of Marketing and traditionally comprise the basic information about a product.

Certain items, such as soda, bottled water, juice, beer, and margarine can have two separate, simultaneous locations within a retail store. For example, beer can be located within a storage cooler and an adjacent floor display. To correctly plan supply, orders, and marketing, it is necessary to know from which of the two locations a particular product was sold. At present, marketers have to guess at pertinent questions:

How much did I sell from my normal selling space?

How much did I sell from the display?

How did this display effect the product's promotion?

Thermochromic Materials

Thermochromic materials are substances which emit different colors at associated temperature ranges. Thermochromics have been used as active components in temperature-specification devices, as shown in U.S patent 4,156,365 to Heinmets et al (1979), U.S. patent 5,144,112 to Wyatt et al. (1992), and U.S. patent 5,622,137 to Lupton, Jr. et al. (1997). Each of these patents requires a human operator to visually identify the material's color and estimate its temperature accordingly. These inventions do not account for the different color-perception capabilities, or lack of color perception, among the general population.

Some thermochromic materials exhibit a one-time, permanent (quondam) change in color, as the one demonstrated in U.S. patent 5,622,137 to Lupton, Jr. et al. (1997), while other thermochromics are reversible, as shown in U.S. patent 5,558,700 to Shibahashi et al. (1996), and U.S. patent 5,480,482 to Novinson (1996).

Objects and Advantages

Accordingly, the object of this invention is to provide an accurate method of establishing the temperature range of a product to which a bar code is attached. Several other objects and advantages of the present invention are:

(a) to provide a bar code that requires no hardware modifications of bar code readers;

(b) to provide a bar code that can establish a historical temperature range that marks product as unsalable;

(c) to provide a bar code that can be printed using current package printing technologies;

(d) to provide a bar code that will not significantly increase the price of the packaging;

(e) to provide a bar code that identifies the position from where the product was selected when the product has multiple locations;

(f) to provide a bar code that can contain two different codes;

(g) to provide a bar code that allows the temperature differences among a set, sample, or population of items to be efficiently identified.

Drawing Figures

Fig 1 shows an example of a UPC bar code.

Fig 2-A shows a thermochromic UPC bar code at standard room temperature.

Fig 2-B shows the same UPC bar code from Fig 2 when stored below 65 degrees F.

Fig 3 shows an exploded view of the bar code from Fig 1.

Fig 4-A shows an exploded view of the bar code from Fig 2.

Fig 4-B shows an exploded view of the bar code from Fig 3.

Fig 5 shows an example of a null UPC bar code.

List of Reference Numerals

10	Bar code
20	Module
30	Digit
40	Check Digit
50	Numeric Character
60	UPC Version A Bar code
70	Numeric Character Set
80	Thermochromic Digit
90	Light Module
100	Dark Module
110	Thermochromic Module
120	Null Bar code
130	Thermochromic Bar code

Summary

The purpose of this invention is to provide a method of determining an item's temperature range when its bar code is scanned. This is accomplished by printing its bar code with thermochromic material(s) such that two separate codes are stored on the same bar code and such that each code is exclusively visible within a specific temperature range.

Description–Figs 1 to 5

An example bar code **10** shown in Fig 1 is a UPC Version A bar code **60**. Within bar code **10** is a series of parallel dark lines and light spaces of varying thickness which represent a numeric combination. Below bar code **10** is a numeric character set **70** which translates bar code **10**. A digit **30** is a unit of barcode **10** consisting of two dark bars and two light spaces. Fig 1 illustrates bar code **10** with twelve digits **30**. A module **20** is the smallest defined space in bar code **10**. There are seven modules **20** per digit **30**. Each digit **30** of bar code **10** is represented by a numeric character **50** located directly below digit **30**. A check digit **40** is used to verify barcode 10.

Each digit **30** is represented by seven modules **20**. A light module **90** and a dark module **100** are shown in Fig 3. Each unique digit **30** is constructed of a set of light modules **90** (Fig 3) and dark modules **100**. The arrangement of modules **20** (Fig 1) creates the visual appearance of a series of dark lines and light spaces within bar code **10**.

A typical embodiment of the present invention is illustrated in Figs 2-A and 2-B. A thermochromic bar code **130** (Figs 2-A and 2-B) incorporates thermochromic materials into modules **20** of one of its digits **30** and its check digit **40**. Thermochromic materials, including inks, are materials which display different colors at different temperature ranges. For example, a single ink made of thermochromic materials can be black at one temperature range and transparent at another temperature range. A thermochromic module **110** (Fig 4-A and 4-B) is printed with thermochromic materials. A thermochromic digit **80** (Figs 2-A and 2-B) is

comprised of thermochromic modules **110** (Fig 4-A and 4-B) instead of standard ink modules **20** (Fig 1). An example of a null barcode **120** is shown in Fig 5. Null barcode **120** (Fig 5) incorporates thermochromic materials into all of its digits **30**.

From the description above, a number of advantages of the thermochromic bar code become evident:

- The thermochromic bar code provides the ability to print two bar codes within the space of a single bar code. A secondary bar code can replace a base bar code when the desired temperature range in achieved.
- The thermochromic bar code can be printed using normal packaging printing technology without significantly increasing printing costs.
- The thermochromic bar code requires no hardware modifications of bar code readers.
- The thermochromic bar code allows several new functional uses of a bar code. For example, it can establish and maintain a previous temperature range which then can be used to record a environmental event in the bar code's history. This functionality can used practically to determine if a product, such as meat, has reach a dangerous temperature range. It can also can be used to establish temperature differences in a group of items. The most apparent commercial use is its attachment to a retail product that has both hot and cold locations within a store. This will allow businesses in the supply chain to identify from which location the product was actually sold.

Operation–Figs 1 to 5

Thermochromic bar code **130** (Figs 2-A and 2-B) can be printed using current standard printing technology. It can be scanned by any bar code reader (not shown). A bar code reader is a device which can optically scan bar code **10** (Fig 1) and translate its code into electrical signals.

The purpose of this invention is to incorporate two separate bar codes **10** (Fig 1) within the space of one bar code **10** (Fig 1) such that each code is exclusively visible at a specific temperature range. One possible method of printing thermochromic bar code **130**, as shown in Figs 2-A and 2-B, is to first print bar code **10** (Fig 1) in standard ink, then print overlapping module(s) **20** (Fig 1) with thermochromic material. The thermochromic materials used are only visible at a certain temperature range. When the temperature of thermochromic bar code **130** is not within this range, it appears as Fig 2-A. When the temperature of thermochromic bar code **130** is within this range, thermochromic modules **110** (Figs 4-A and 4-B) will become visible and display thermochromic bar code **130** as seen in Fig 2-B. This method allows for two or more separate bar codes **10** to be printed in the same area of a single bar code **10**.

Depending on the type of thermochromic materials used, the thermochromic bar code could have different uses:

- To identify product position within a store, the thermochromic materials used will be able to convert repeatedly from visible to invisible, as shown in Figs 2-A and 2-B, depending on the product's current temperature.
- To identify a product's temperature history or to determine whether a product has been exposed to undesirable thermal conditions, the bar code would be created with thermochromic materials that transform permanently into a null bar code. The null bar code shown in Fig 5 is one in which no distinction between dark modules and light

modules can be made by scanning equipment. An example of said null bar code would be an area of solid black or solid white.

Sources of Supply

The following companies are suppliers of thermochromic materials and dyes:

CHROMATIC TECHNOLOGIES INCORPORATED, Ithaca, New York

SPEAR U.S.A., Mason, Ohio

FLINT INK CORPORATION, Dallas, Texas

MCK CONSULTING INC., Mississauga, Ontario

Conclusion, Ramifications and Scope of Invention

The thermochromic bar code described here will provide suppliers and retailers a reliable method of determining whether a product sold came from a refrigerator or a shelf. This is accomplished by using the thermochromic properties of an ink to imbed a second bar code within a primary bar code. This relatively inexpensive process of identifying product will require minimum hardware and software modification of enterprises in the supply chain.

Although the description above contains many reference to the UPC bar code, this invention is not limited to the UPC. It can be used for EAN, JAN, and any other bar code for which the use of this process is desired. This thermochromic bar code could also be useful as an efficient method of identifying temperature differences among a set, sample, or population of items.

Similarly, an entire thermochromic bar code could be attached to a product that must be maintained below a certain temperature range. If the temperature exceeds the desirable range, the bar code would disappear, either partially or wholly. For example, assume milk must be kept below 52 degrees Fahrenheit. Exposure above that temperature range causes the quality of the product to degrade. If the carton exceeds the safety temperature, the UPC code would permanently vanish making the product unsalable.

Accordingly, the scope of this invention should be determined not by the embodiment illustrated, but by the appended claims and their legal equivalent.

Claims:

1. A method of producing a bar code, comprising:

(a) any base bar code printed in a usual and customary manner, and

(b) at least one module printed with a thermochromic material within said base bar code,

whereby, the storage temperature of said bar code can be determined when said bar code is scanned by a bar code reader and,

whereby, a plurality of codes can be incorporated into the space of a single bar code.

2. A method of producing a bar code comprising:

(a) a revocable bar code printed entirely with a quondam thermochromic material

whereby, said bar code can be rendered permanently invisible to warn a bar code reader of an existing or historically undesirable environmental condition.

3. A method of producing a bar code comprising:

(a) a base bar code printed with a thermochromic material, and

(b) at least one module printed with at least one other thermochromic material within said base bar code,

whereby, each thermochromic material responds to a separate temperature range, and

whereby, said bar code can display a plurality of predetermined codes, including a null code, in order to measure a series of temperature variations.

Abstract: A bar code **10** incorporating thermochromic materials in selected modules **20** such that its code changes with temperature. Below a specified temperature, the bar code **10** displays the code as in Fig 3. Above this temperature, the bar code **10** shows a new code as in Fig 2. The bar code **10** is printed with conventional printing equipment (not shown) onto conventional printing media, and is scanned with conventional bar code scanning equipment (not shown).

Declaration for Utility or Design Patent Application

As a below-named inventor, I hereby declare that my residence, post office address, and citizenship are as stated below next to my name and that I believe that I am the original, first, and sole inventor [if only one name is listed below] or an original, first, and joint inventor [if plural names are listed below] of the subject matter which is claimed and for which a patent is sought on the invention, the specification of which is attached hereto and which has the following title:

"Thermochromic Bar Code"

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to in the oath or declaration. I acknowledge a duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Section 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Please send correspondence and make telephone calls to the First Inventor below.

Signature: Sole/First Inventor: [signature]

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Telephone: 214-521-6169

Signature: Joint/Second Inventor: [signature]

Print Name: Tobin Gaedke Date: 1997 Dec 6

Legal Residence:* 901 NI-45 #F6202 Ennis TX Citizen of: US

Post Office Address: 901 NI-45 #F6202
Ennis TX 75119

Telephone: 972-878-6376

* City and state, county and state or city, state and country, if foreign.

In the United States Patent and Trademark Office

First/Sole Applicant: Jon David Cameron

Joint/Second Applicant: Tobin Alexander Gaedke

Title: "Thermochromic Bar Code"

Small Entity Declaration—Independent Inventor(s)

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35 United States Code, to the Patent and Trademark Office with regard to my above-identified invention described in the specification filed herewith. I have not assigned, granted, conveyed, or licensed—and am under no obligation under any contract or law to assign, grant, convey, or license—any rights in the invention to either (a) any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or (b) any concern which would not qualify as either (i) a small business concern under 37 CFR 1.9(d) or (ii) a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed—or am under an obligation under contract or law to assign, grant, convey, or license—any rights in the invention is listed below:

☒ There is no such person, concern, or organization.

☐ Any applicable person, concern, or organization is listed below:*

Full Name: _____

Address: _____

_____

I acknowledge a duty to file, in the above application for patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Signature of Sole/First Inventor	Signature of Joint/Second Inventor
Jon David Cameron	Tobin Gaedke
Print Name of Sole/First Inventor	Print Name of Joint/Second Inventor
6 December 1997	6 December 1997
Date of Signature	Date of Signature

*Note: A separate Small Entity Statement is required from any listed entity.

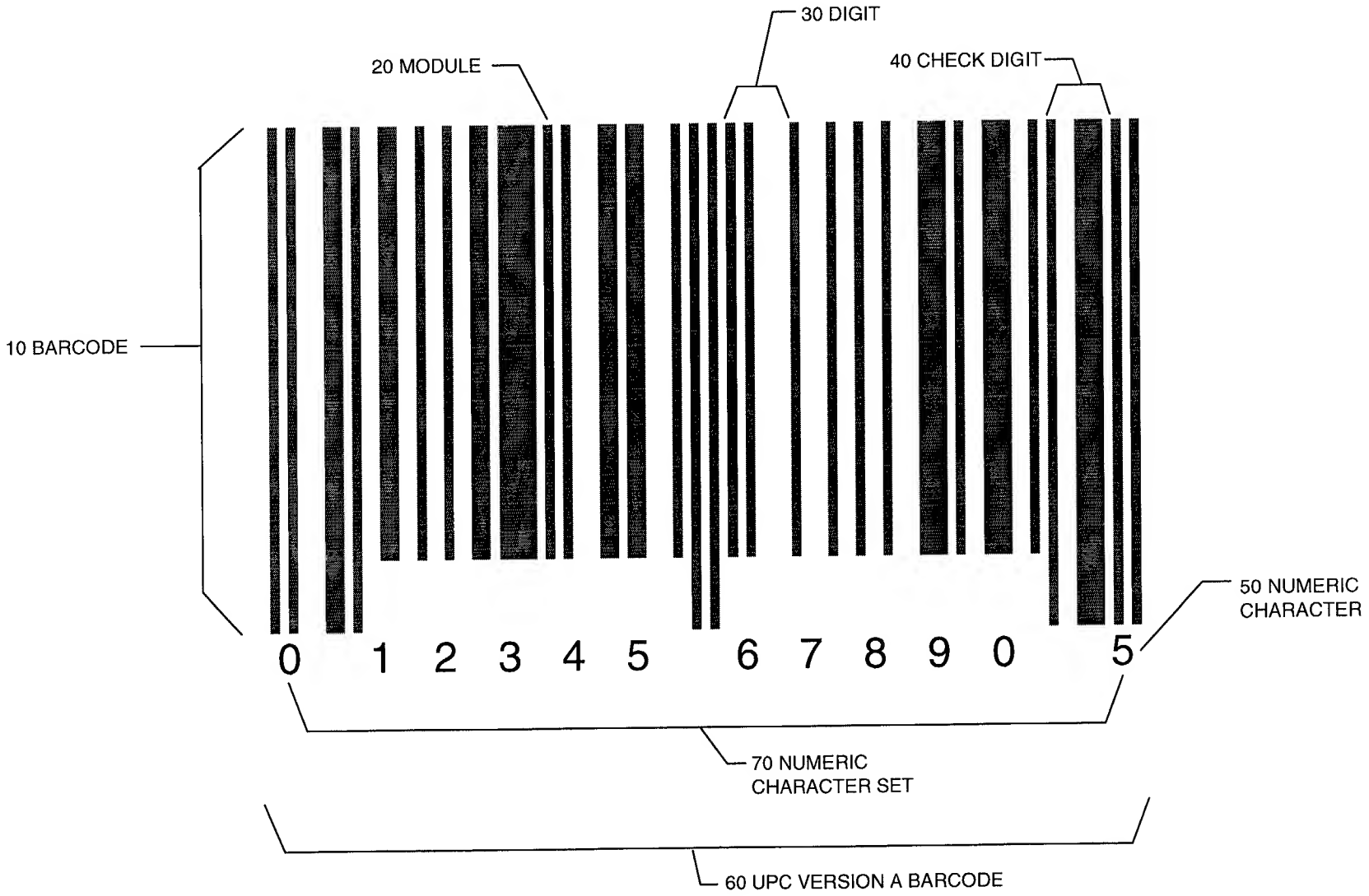
30 DIGIT
20 MODULE
40 CHECK DIGIT
10 BARCODE
50 NUMERIC CHARACTER
0 1 2 3 4 5 6 7 8 9 0 5
70 NUMERIC CHARACTER SET
60 UPC VERSION A BARCODE

FIG 1

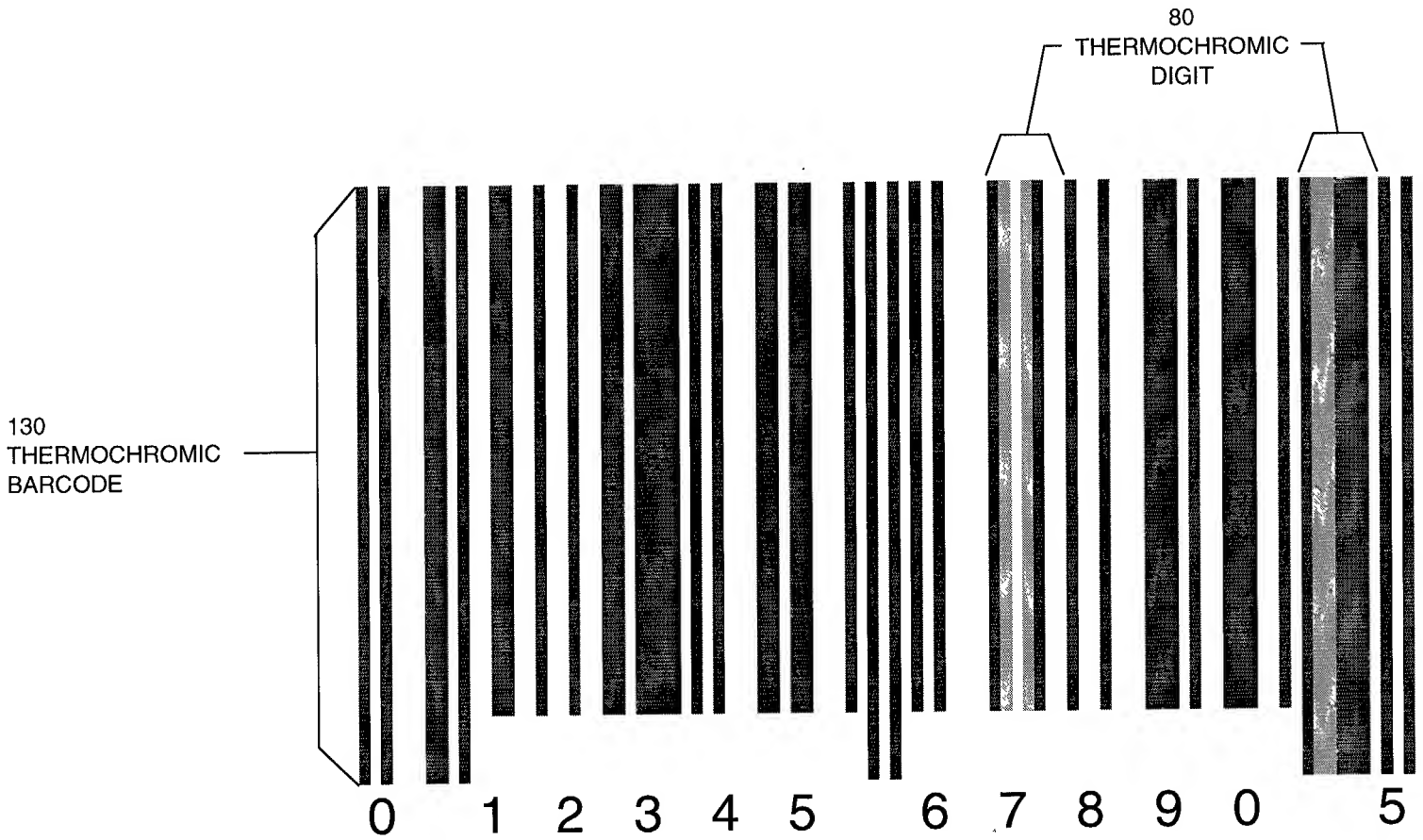
80
THERMOCHROMIC
DIGIT
130
THERMOCHROMIC
BARCODE
0 1 2 3 4 5 6 7 8 9 0 5

FIG 2-A

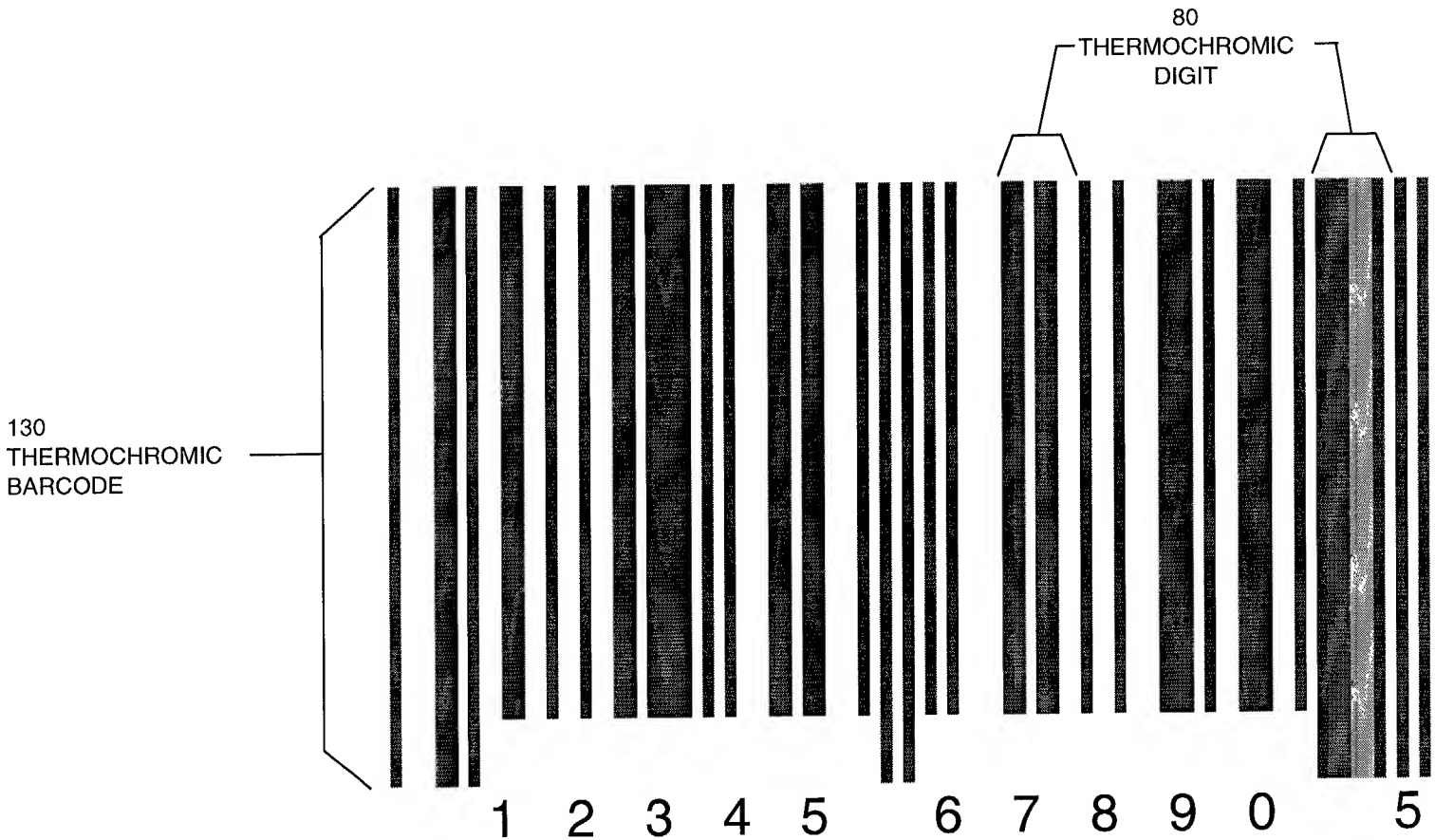
80
THERMOCHROMIC
DIGIT
130
THERMOCHROMIC
BARCODE
1 2 3 4 5 6 7 8 9 0 5

FIG 2-B

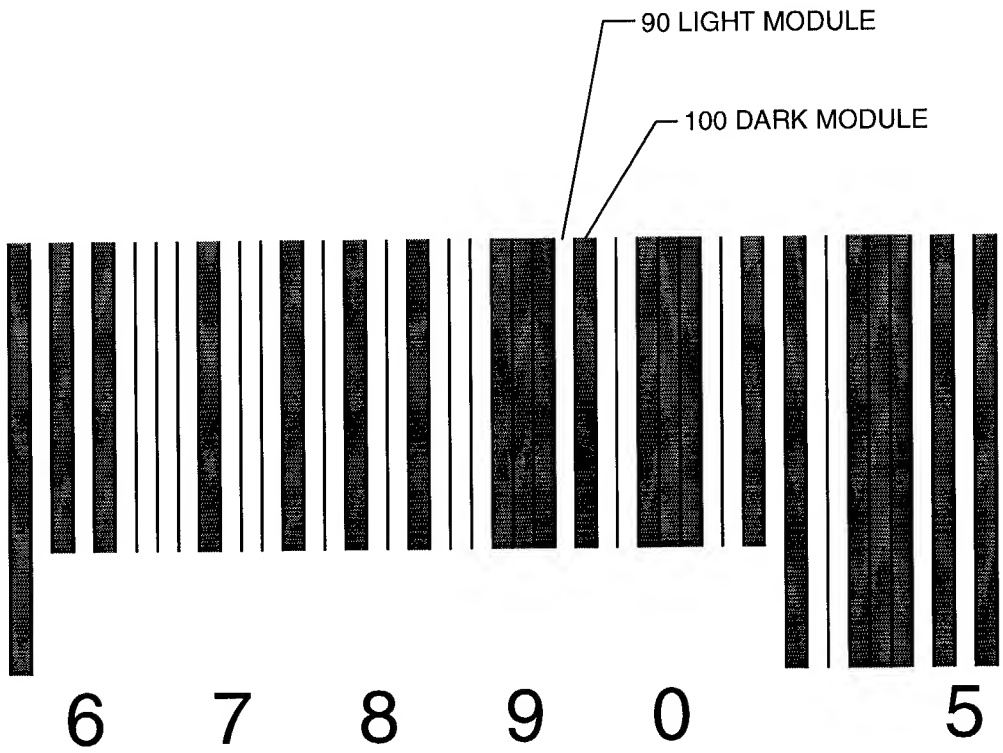

FIG 3

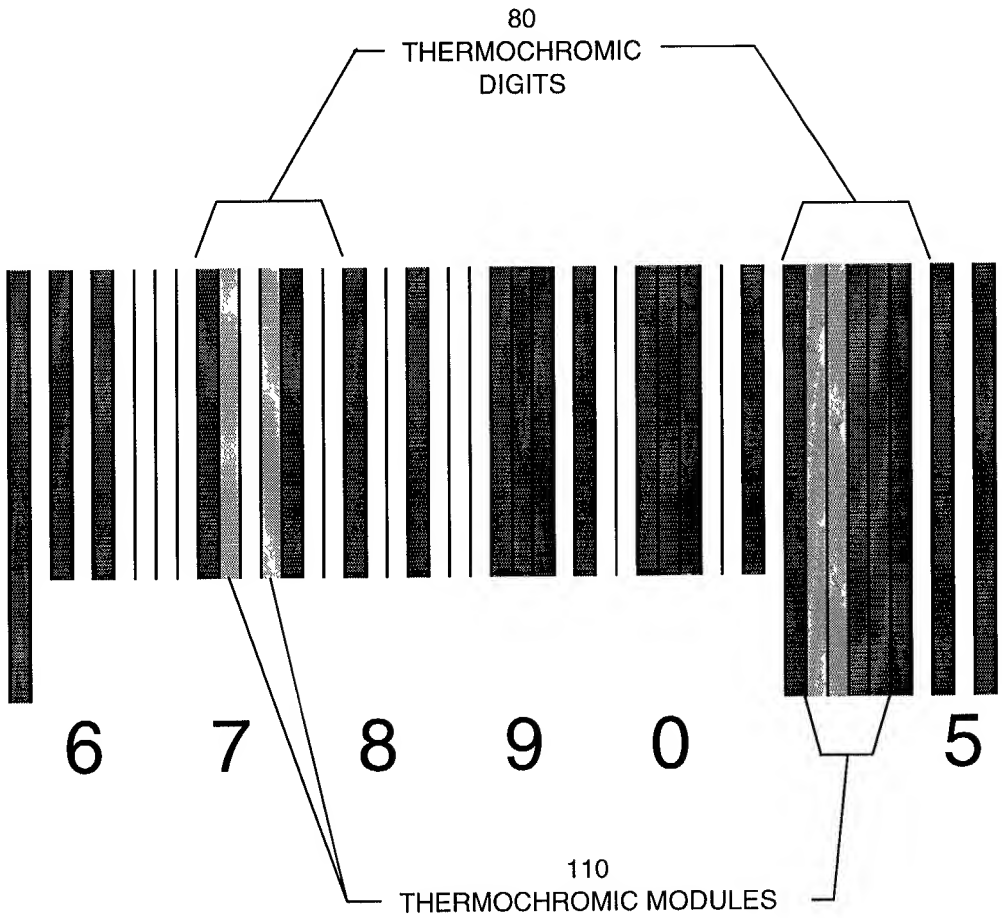
80
THERMOCHROMIC
DIGITS
6 7 8 9 0 5
110
THERMOCHROMIC MODULES

FIG 4-A

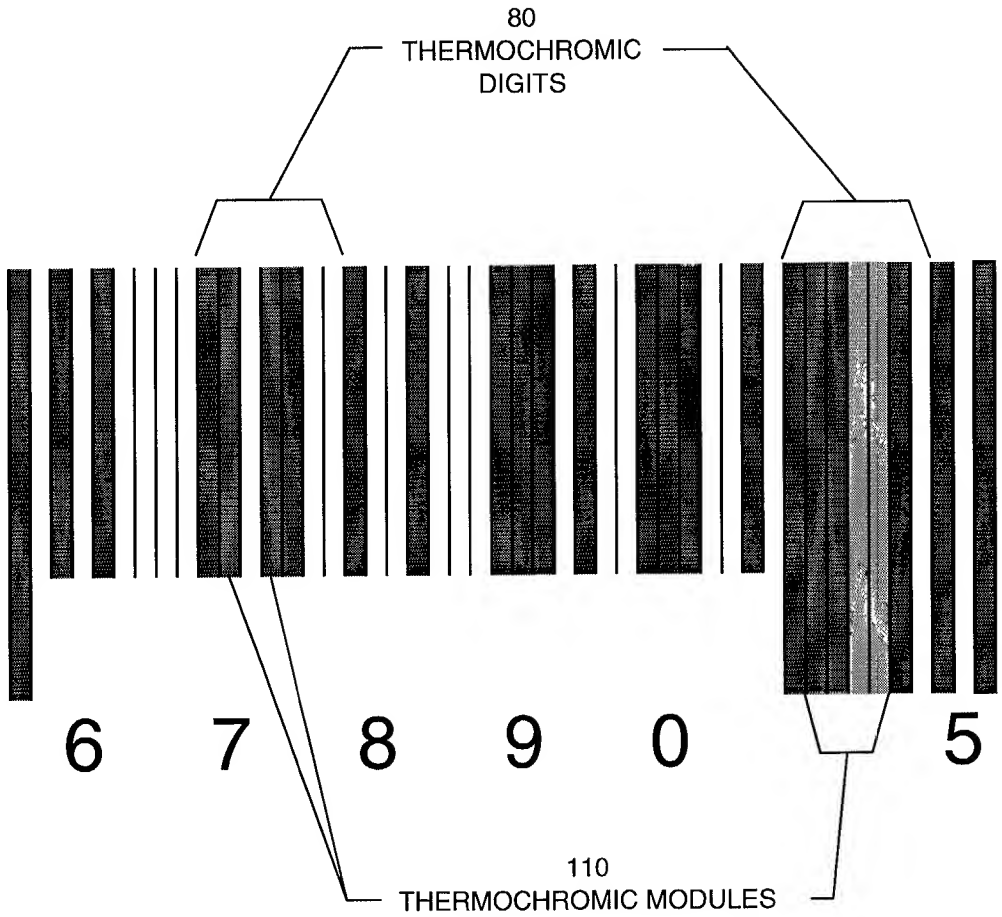
80
THERMOCHROMIC
DIGITS
6 7 8 9 0 5
110
THERMOCHROMIC MODULES

FIG 4-B

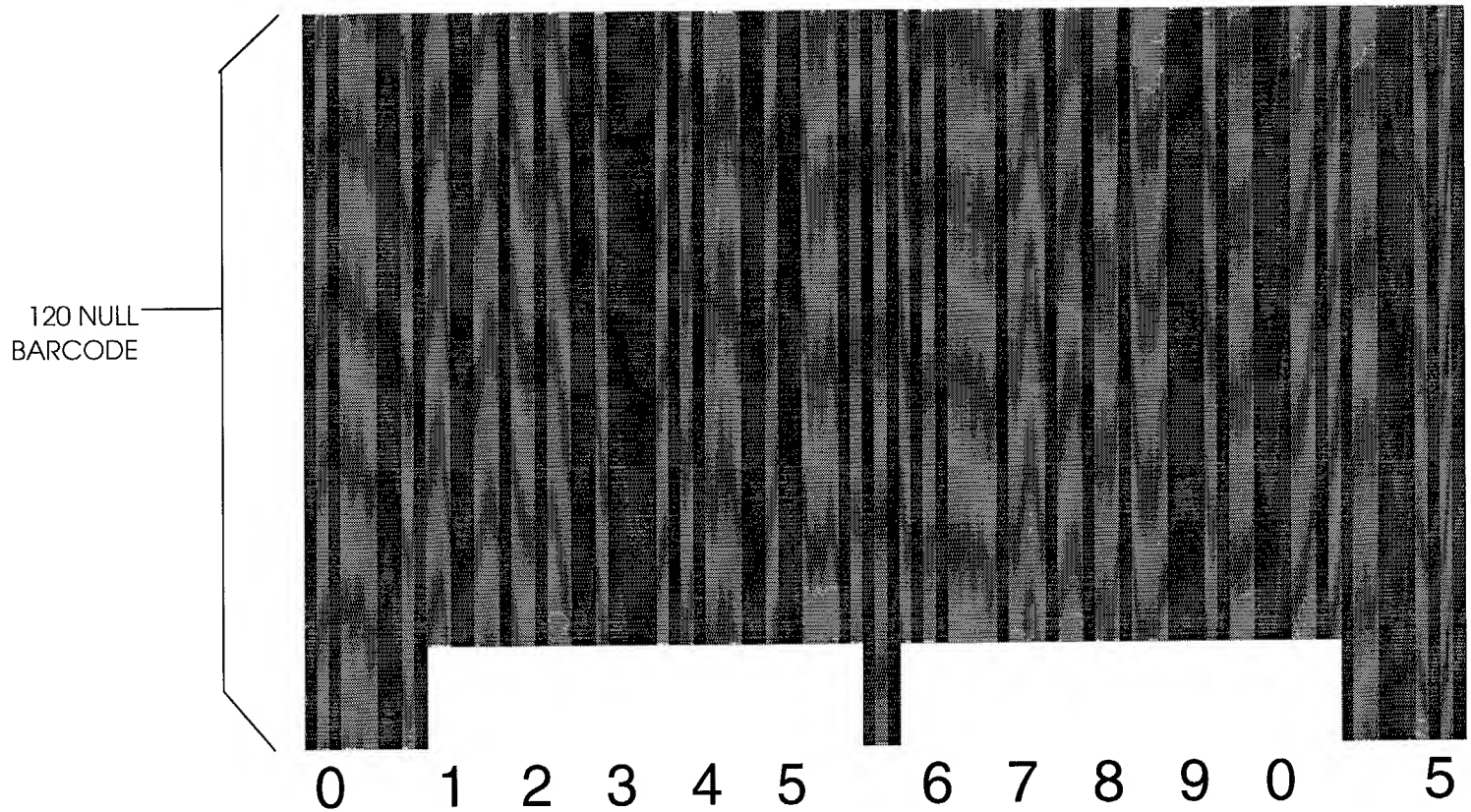

FIG 5